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Cerebrovascular disease in North East Thailand

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Abstract

A retrospective study was carried out in 248 stroke patients with CT scan of the brain who were admitted to the medical department of Maharaj Nakornratchasima Hospital, North East Thailand from September 1995 to February 1996. The average age was 59.4 years. 70.6% of the cases were male. Known risk factors were identified in 62.1%; with hypertension being the most common, followed by diabetes mellitus, heavy smoking, atrial fibrillation, hyperlipidemia, previous stroke, and ischemic heart disease. 27.4% of the stroke were hemorrhagic, 72.6% ischemic. Embolic infarct accounted for 7.7% of the cases. The neurological signs on presentation according to frequency of occurrence were: motor paralysis (79.5%), dysphasia (22.5%), cerebellar ataxia (10.4%), altered consciousness (10.0%) and hypalgesia (4.0%). CT brain scan was abnormal in 65.3% of the cases, showing ischemic or hemorrhagic changes in supratentorial (59.5%) and infratentorial (6.8%) compartments. The mortality rate was 12.1% by 6 months. The main causes of death were brain herniation and pneumonia. By 6 months, 73% of the 218 surviving patients was partially or totally independent. 36.2% was able to return to their original work while 6% remained severely disabled.

Key words: stroke, Thailand, clinical profile, CT brain scan, outcomes

INTRODUCTION

Stroke is the most common neurological disease in Thailand.[1] Excluding motor vehicle accidents, it is the second leading cause of death in the country — after heart disease and before cancer. The disease often causes a catastrophic psychosocial impact on the patient and the family, in addition to being a huge economic and medical care burden to society. Despite these, few stroke-related research work have been done previously in Thailand. The previous studies dealt with risk factors in rural[2] and in urban[3] communities, accuracy of clinical stroke score in diagnosis[4], and effect of steroids on the treatment.[5] The purpose of this study is to explore the clinical profile of stroke patients especially the age, sex, risk factors, duration of symptoms before admission, neurological signs, types of stroke, causes of death and outcomes.

MATERIALS AND METHODS

This is a retrospective study of the stroke patients admitted to the Department of Medicine, Maharat Nakhonratchasima Hospital. The Hospital is a 1000-bed medical center in Northeast Thailand. It is a public community hospital serving the surrounding 2.5 million population, as well as the referral centre for the 4 to 5 nearby provinces. It is the second teaching hospital for the Ramathibodi Medical School. Patients admitted from September 1995 to February 1996 with cerebrovascular accident were identified and the case notes retrieved. Only patients with CT brain scan were included in the analysis. Those with transient ischemic attacks were also excluded. The diagnosis and classification is according to the WHO criteria[6] which is as follows:

Stroke: A syndrome with rapidly developing clinical signs of a localized or generalized disturbance of brain function, persisting for > 24 hours, or leading to death, in the absence of possible causes other than those of vascular origin.

Cerebral infarction: An ischaemic necrosis of a part of the brain caused by obstruction of the perfusing artery by a thrombus or by emboli.

Cerebral embolism: A sudden blocking of a cerebral artery by a clot or other material brought to the point of blockage by the blood stream. The term also refers to the resulting clinical disease.

Cerebral thrombosis: A formation, development or presence of thrombus in a cerebral artery and the resultant clinical disease.

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TABLE 1: Distribution of age and sex

Age group (years)	Male n	Male %	Female n	Female %	Total n	Total %
21 – 30	2	0.8	0	0	2	0.8
31 – 40	9	3.6	0	0	9	3.6
41 – 50	44	17.8	3	1.2	47	18.9
51 – 60	54	21.8	32	12.9	86	34.7
61 – 70	50	20.2	22	8.9	72	29.1
71 – 80	7	2.8	10	4.0	17	6.8
> 80	9	3.6	6	2.4	15	6.0
Total	175	70.6	73	29.4	248	100

Intracerebral haemorrhage: A haemorrhage originating from a vessel in the brain parenchyma. The term is used both for the pathological condition and for the resulting clinical disease. The condition is usually hypertensive in origin but sometimes occur as a result of ruptured arteriovenous aneurysm in the brain.

The mortality rate and cause of death by 6 months were noted. The functional status of the survivors at 3 weeks, 3 months, and 6 months was evaluated by Rankin Scale[7] (RS) which is as follows:

1 = *No significant disability*: able to carry out all usual duties
2 = *Slight disability*: unable to carry out some of previous activities but able to look after own affairs without assistance
3 = *Moderate disability*: requiring some help but able to walk without assistance
4 = *Moderately severe disability*: unable to walk without assistance and unable to attend to own bodily needs without assistance
5 = *Severe disability*: bedridden, incontinent, and requiring constant nursing care and attention

As for the risk factors, "heavy smoking" was when a patient smoked more than one pack of cigarettes per day for more than 20 years; "hyperlipidemia" was when the serum cholesterol was over 250 mg/dl and/or triglyceride more than 160 mg/dl; "hypertension" was when blood pressure was ≥ 160/95 mm Hg; "diabetes mellitus" was when the fasting plasma glucose was ≥ 120 mg/dl.

RESULTS

From September 1995 to February 1996, 464 patients were diagnosed to have cerebrovascular accident. 173 patients were excluded from the study as CT brain scanning was not done; 39 patients were excluded as they did not complete the 6-month follow ups. 4 patients diagnosed to have subarachnoid and intraventricular haemorrhage were excluded as cerebral angiogram was not done to elaborate the primary cause of bleeding. A total of 248 patients were included in this study, there were 175 males and 73 females. The average age was 59.4 years, the range was 22-93 years, the male patients was younger by about 7 years. The mean age was male (57.4 years), female (64.2 years); the median age was male (57 years), female (62 years). Most of the male stroke patients were in the 41-70 age group, and female patients in the 51-80 age group. (Table 1)

Table 2 list the types of stroke among the two

TABLE 2: Sex and type of stroke

Sex	Cerebral infarction n	Cerebral infarction %	Intracerebral hemorrhage n	Intracerebral hemorrhage %	Total n	Total %
Male	122	49.2	53	21.4	175	70.6
Female	58	23.4	15	6.0	73	29.4
Total	180	72.6	68	27.4	248	100.0

TABLE 3: Type and subtype of stroke

Type	n		%	
Infarction	180		72.6	
Thrombotic (non-embolic)		161		64.9
Embolic		19		7.7
Hemorrhage	68		27.4	
Intracerebral		58		23.4
Intracerebral with intraventricular		10		4.0

sexes. Males was affected 2.1 times more than females in cerebral infarct, whereas it was 3.5 times more in intracerebral haemorrhage. Table 3 lists the subtypes of stroke. As shown, 7.7 % of all the stroke were due to cardiac emboli. Table 4 lists the risk factors according to the types of stroke among the sexes. The leading risk factors were: hypertension, diabetes mellitus, hyperlipidemia, heavy smoking and atrial fibrillation. Hypertension was particularly important in intracerebral haemorrhage. It was seen in 56% of patients with intracerebral haemorrhage, but only 36% of patients with cerebral infarct.

Table 5 lists the neurological signs on admission. As shown, the most common neurological signs on presentation were: motor paralysis, dysphasia, cerebellar ataxia and altered consciousness. Altered consciousness was relatively more common in patients with intracerebral hemorrhage (22%) as compare to cerebral infarct (5.6%)

Duration of symptoms before admission is as in Table 6. As shown, three quarter of the patients were brought to hospital 1 to 3 days after the onset of symptoms. Only 20.2% of the patients came to hospital within 24 hours.

The results of the CT brain scan are listed in Table 6. As shown, 75.4% of the patients had abnormal CT scan. Of those showing infarction and hemorrhage, 90% were in the supratentorial compartment whereas 10% were in the infratentorial compartment.

The overall mortality was 12.1% by 6 months of followup, 10% in the patients with cerebral infarct and 17.6% among those with intracerebral hemorrhages. The causes of death of the patients with infarct or hemorrhage and those who died within and after 72 hours are listed in Table 8. As shown, all the eight patients with intracerebral

TABLE 4 : Distribution of risk factors and types of stroke

Risk factors	Male				Female				Total
	Infarction		Hemorrhage		Infarction		Hemorrhage		
	n	%	n	%	n	%	n	%	%
No risk factors	49	19.8	15	6.0	25	10.1	5	2.0	37.9
Positive risk factors	73	29.4	38	15.3	33	13.4	10	4.0	62.1
Hypertension	42	16.9	28	11.3	23	9.3	10	4.0	41.5
Diabetes mellitus	17	6.8	3	1.2	17	6.8	7	2.8	17.6
Hyperlipidemia	3	1.2	7	2.8	13	5.2	3	1.2	10.4
Heavy smoking	20	8.1	10	4.0	3	1.2	0	0	13.3
Atrial fibrillation	17	6.8	0	0	7	2.8	0	0	9.6
Rheumatic heart disease	2	0.8	0	0	0	0	0	0	0.8
Ischemic heart disease	7	2.8	0	0	0	0	0	0	2.8
Previous stroke	9	3.6	3	1.2	7	2.8	0	0	6.8

TABLE 5: Neurological signs on admision

Neurological signs	Infarction		Hemorrhage		Total	
	n	%	n	%	n	%
Motor disturbance	144	58.1	53	21.4	197	79.5
Undetermined	4	1.6	4	1.6	8	3.2
No motor disturbance	32	12.9	11	4.4	43	17.3
Cerebellar ataxia	23	9.2	3	1.2	26	10.4
Aphasia or dysphasia	34	13.7	22	8.8	56	22.5
Hypalgesia	4	1.6	6	2.4	10	4.0
Normal consciousness	170	68.6	53	21.4	223	90.0
Altered consciousness	10	4.0	15	6.0	25	10.0
drowsy	4	1.6	4	1.6	8	3.2
stuporous	4	1.6	5	2.0	9	3.6
comatose	2	0.8	6	2.4	8	3.2

TABLE 6: Duration of symptoms before admission

Duration	n	%
< 24 hours	50	20.2
1 – 3 days	188	75.8
> 3 days	10	4.0

TABLE 7: Results of CT brain scan

	n		%	
Normal	61		24.6	
Atrophic brain	25		10.1	
Infarction	94		37.9	
Basal ganglion		54		21.8
Thalamus		4		1.6
Brainstem		7		2.8
Cerebellar		7		2.8
Subcortical		16		6.5
Middle cerebral artery teritory		4		1.6
Multiple infarction		2		0.8
Hemorrhage	68		27.4	
Basal ganglion		35		14.2
Thalamus		12		4.8
Subcortical		8		3.2
Brainstem		3		1.2
Basal ganglion with intraventricular		10		4.0

TABLE 8: Causes of death and type of stroke

	Within 72 hours				After 72 hours				Total
	Infarction		Hemorrhage		Infarction		Hemorrhage		
	n	%	n	%	n	%	n	%	%
Brain herniation	0	0	8	26.7	2	6.7	2	6.6	40.0
Brainstem dysfunction	2	6.7	0	0	2	6.7	0	0	13.4
Pneumonia	0	0	0	0	10	33.2	2	6.7	39.9
Urinary tract infection	0	0	0	0	2	6.7	0	0	6.7
Total	2	6.7	8	26.7	16	53.3	4	13.3	100

hemorrhge who died within 72 hours were due to brain herniation.

The outcomes of the 218 survivors by Rankin Scale (RS) at 3 weeks, 3 months and 6 months are listed in Table 9. At 3 weeks, 63.3% were in the severely disabled groups with RS grades 5 and 4. However, by the end of 6 months, these were reduced to 27.1%. More than half of these patients improved to become ambulant without assistance (RS grade 3 or better). At 3 weeks after the stroke onset, 30 patients (13.7%) were able to return to work. At 6 months, the number of patients who were able to resume their original job was 79 (36.2%). However, only 33 patients (15.1%) were able to reach their previous work performance.

DISCUSSION

This is a retrospective study of 248 hospital-based stroke patients with CT brain scan in North East Thailand. The age range is 22 to 93 years in the present series, compared to 14-90 years in Malaysia[8], 8 to 95 years in the ASEAN cooperative stroke study[9], and 21 to 94 years in an Australian series.[8] The upper end of the age range in the above studies quoted is constant at 90 plus years. It reflects the upper limit of human life span. The lower end is however, arbitrary, as childhood stroke is often excluded in the various stroke studies, and is reported separately in the literature.[10,11] This is also true in the present study which is a common practice in Thailand.

The mean age of 59.4 years is almost exactly the same as that reported in the ASEAN cooperative stroke study (59.9 years)[9], and is close to the series from Siriraj Hospital, Bangkok (60.3 years)[4], and Malaysia (61.8 years).[8] One may conclude that the mean age for stroke in the South East Asian countries is, at the present time, approximately 60 years. The mean age for stroke is however higher among caucasians, 70.39 years for a series from Melboune, Australia[8], and 66.9 years from Moscow, Russia.[12] The lower mean age for stroke in South East Asian countries reflects the lower mean age of the general population, which is due to a lower life expectancy and higher birth rate. There may also be a true high incidence of young strokes due to the factors such as greater prevalence of rheumatic valvular disease. The lower life expectancy may also contribute to the lower mean age of stroke among men. There is a definite correlation between life expectancy and mean & median age of stroke in both sexes. The reason for the disproportionate common occurrence of intracerebral hemorrhage among men is unclear.

TABLE 9: Outcomes by Rankin Scale after stroke

Scale	3 weeks		3 months		6 months	
	n	%	n	%	n	%
5	102	46.8	43	19.7	13	6.0
4	36	16.5	66	30.3	46	21.1
3	20	9.2	30	13.8	50	22.9
2	33	15.1	33	15.1	50	22.9
1	27	12.4	46	21.1	59	27.1

The relatively common occurrence of intracerebral hemorrhage (27.4%) in this series is consistent with data from elsewhere in Asia, which are: Hong Kong (27.0%)[13], Singapore (25%)[14], ASEAN cooperative stroke study (20%)[9], Malaysia (17.2%)[8] and Siriraj Hospital, Bangkok (43.1%).[4] The corresponding data from the Caucasian population are: Harvard (10%)[15], Moscow (11.9%)[12] and Melbourne (11.7%).[8] The occurrence of infarct would thus be correspondingly lower among the Asians, being 50% from Hong Kong[13], 58% from Taipei[16], as compared to 73% from Caucasians world wide.[17] We have shown that hypertension is particularly important in causing intracerebral hemorrhage rather than cerebral infarct. Effective control of hypertension is probably also the important reason for the decline of stroke mortality in the developed world.[18,19] North East Thailand is a farming area where per capita income is relatively low and health education inadequate. Most people still do not understand why control of hypertension, diabetes mellitus, and hyperlipidemia is needed in both prevention and treatment of the stroke. It is tempting to attribute the relative common occurrence of intracerebral hemorrhage to hypertension. The proportion of embolic stroke in this series (7.7%) is in the same range as those reported from Malaysia (10.9%)[8], Harvard (10%)[15], Caucasians from worldwide (12%)[17], but not in Russia (2.9%).[12]

As for the risk factors for stroke in this study, it is comparable to the WHO collaborative study[20] for the groups with "no risk factors", hypertension and diabetes mellitus. However, in the Collaborative Study, ischemic heart disease is more common. Risk factors for stroke vary greatly from place to place and from country to country. In the case of hypertension, it is: North East Thailand (41.5%), rural South Thailand (3.7%)[2], Bangkok (19.8%)[3], Vietnam (55%),[21] Singapore (67.8%)[22] and ASEAN cooperative stroke study (71.5%).[9] For smoking, it is: Northeast Thailand (13.3%), rural South Thailand (7.7%)[2], Bangkok (69.1%)[3], Singapore (22.3%)[22] and ASEAN cooperative stroke study (26.5%).[9] For diabetes mellitus, it is: North East Thailand (17.6), Bangkok (9.8%)[3], ASEAN cooperative stroke study (18.9%)[9] and Singapore (39.7%).[22]

Stroke is a catastrophic event and is indeed a frightening illness. This is probably the main reason why 96% of the patients were brought in the hospital within 3 days, earlier than that reported by Marshall and Shaw.[23] Scmidt reported that the usual time for hospitalization for their patients from Moscow was 2 days[12] and Misbach reported the mean admission time to hospitals was 45.3 hours in the ASEAN cooperative stroke study.[9] In the present series, only 20.2% was able to arrive to hospital in <24 hours in our study, this is far from ideal when considering the various advances available in the modern treatment of stroke, particularly thrombolytic therapy. The window period for the latter is said to be within 3 to 4 hours after stroke onset. The recent use of the term "brain attack", similar to "heart attack" to describe stroke is aimed to convey the urgency as well as seriousness of the illness to the public. The duration of symptoms before admission reflects the healthcare as well as the non-sudden onset category of stroke as noted in the Harvard study; i.e. stroke with stepwise or stuttering, smooth or gradual, and fluctuating onset.[15]

The neurological signs on admission are similar to other studies.[12,24,25] Altered consciousness appear to favour a diagnosis of intracranial hemorrhage (22%) rather than cerebral infarct (5.6%). Coma was seen in 8.8% of intracranial hemorrhage but only 1.1% of cerebral infarct. However, clinical indicators which are the basis for the various stroke scores are insufficient to exclude hemorrhage before anticoagulation treatment is started.[27]

The mortality rate of the present study at 12.1% overall, 10% for infarct and 17.6% for hemorrhage is lower than that from another study in Bangkok whose corresponding figures are 25%, 19.5% and 45.16%.[26] The comparable mortality for the ASEAN coorperative stroke study is 21%[9] and that from Scmidt et al in Moscow 37.3%.[12] The main causes of death is similar to reports from elsewhere, brain herniation and sepsis. The known prognostic indicators for stroke are: age, type of stroke, disturbance of consciousness and severity of the underlying or associated disease.

The long term outcome of our patients is encouraging. After 6 months, only 6% remained in severe disability (RS grade 5), 73% was ambulant without assistence (RS grade 3 or better) and 36.2% of the patients were able to return to the original work, although only 15.1% were able to achieve their previous work performance. Tan reported from Singapore that 89% of the patients was able to ambulate with or without aids on discharge from the rehabilitation ward after stroke.[28] Marquardsen from Denmark reported that 41% of their stroke survivors were able to return to paid job.[29]

Harmsen & Wilhemsen reported that 50% of their stroke survivors from Goteborg, Sweden was able to work or perform household activities a year after stroke.[24] Sorensen et al reported from Copenhagen[25] that walking was undisturbed in 68%, and 30% were in gainful work or managed domestic activities as before the stroke. Scmidt et al reported from Moscow that 68.2% of their surviving patients were fully independent after one year.[12]

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